Design, Installation and Results of an Autonomous Monitoring System at the Gilt Edge Mine Superfund Site, South Dakota

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Key Words: mine remediation, monitoring, internet, cap

Remediation of acid-generating mine waste-rock dumps is a significant problem, both in the U.S. and globally. The conventional approach to minimizing acid production is to reduce or eliminate oxygen loading and water flow through the rock materials-by utilizing a capping system. Ensuring cap integrity, and understanding the performance dynamics of the capped system requires detailed monitoring information over the lifetime of the capping system. In conjunction with wells to sample-analyze water and pore-gas, an autonomous monitoring system, consisting of a multi-electrode electrical resistivity system, temperature, tensiometer and flow sensors was integrated in the repository below the geo-membrane cap at the Ruby Ridge Repository at the Gilt Edge Mine Superfund site. Data from the monitoring system is automatically entered into a relational database, following which it is processed and visualized by an integrated software package developed through both INEEL and EPA funding. This package allows users to access information on the monitoring system using a standard web browser, set alarms on specific conditions, and request on-demand or automated reports. Information is provided at levels appropriate for operational, regulatory, and scientific purposes. Since the system was started in the summer of 2003 it has provided cost-effective, near real-time information into both the boundary conditions of the dump and the behavior of the dump to a broad spectrum of users, and it is expected that this system could be a template for similar monitoring systems across the country.